REMARKS

Claims 39-42 and 44-52 were pending in the above-referenced application. Claim 42 is canceled without prejudice and Claims 39, 46, 47 and 48 are amended. Such amendments do not add new matter. It follows then that Claims 39-41 and 44-52 are now pending. Applicant respectfully requests reconsideration of such claims in view of the aforementioned amendments and the remarks hereinbelow.

Further, Applicant herewith submits a copy of the Information Disclosure Statement and Form PTO-1449 originally submitted December 15, 1998 of which Japanese Patent No. 6349747 does not yet have an initialed copy from the Examiner. To the extent the PTO-1449 has not already been initialed in the file, such examination and initialing is requested at this time, and returning of a copy to the undersigned.

In addition, Applicant requests that the Examiner indicate in the next action whether or not the drawings for this application, submitted December 15, 1998, have been approved.

Rejection under 35 U.S.C. §112

Claims 48 and 52 are rejected under 35 U.S.C. §112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Applicant traverses.

Claim 52 depends from Claim 48 which recites, in pertinent part:

feeding an organic silicon precursor into the **hot wall, low-pressure chemical vapor deposition reactor** having the substrate positioned therein;

feeding an additional quantity of the gaseous oxide of hydrogen into the hot wall, low pressure chemical vapor deposition reactor while feeding the organic silicon precursor into the reactor, wherein the organic silicon precursor and the additional quantity of the gaseous oxide of hydrogen are fed into the reactor from separate feed streams, **the additional quantity comprising at least about 5% by volume of the material fed into the reactor** (emphasis added).

The Examiner alleges that adding H_2O or H_2O_2 to an organic silicon precursor of SiO_2 would speed up rather than decrease the decomposition rate of the precursor. In support of this position, the Examiner states that such is well known; and refers to page 722, right column, last paragraph of *IslamRaja et al.,* as supporting that the removal of intermediate and product compounds of silicon from the system by deposition onto the substrate speeds up rather than reduces the decomposition of the precursor.

However, as none of the art cited by the Examiner specifically refers to an amount of H_2O or H_2O_2 comparable to that recited by Applicant and the use of an LPCVD reactor, it is asserted that the conclusion reached by the Examiner is incorrect. Thus, where Applicant gives specific process conditions in the specification for the interpretation of the applicant's claims, Claims 48 and 52 cannot be held forth as being rejected under §112, first paragraph absent a showing of art that provides comparable reaction conditions. Applicant respectfully asserts that the atmospheric pressure CVD method of Sukharev having very different concentrations of reactants and precursors CANNOT be held forth as

such a reference since it is well known that AP chemical vapor depositions and LP chemical vapor depositions are NOT processes that can be performed using similar conditions. Furthermore, Applicant asserts that it is well known that such different processes are often used to take advantage of both the aforementioned different reaction conditions as well as the different characteristics of the resulting films. See, Kubo et al. and the discussion of the forming of the various silicon oxide films depicted in Figs. 1A-1F.

Hence, Applicant respectfully asserts that Claims 48 and 52 do meet the requirement of §112, first paragraph, and the instant rejection should be withdrawn, which action is earnestly sought.

Rejection Under 35 U.S.C. §102(e)

Claims 39-40, 42, 44, 47 and 49 are rejected under 35 U.S.C. §102(e) as being anticipated by Sukharev (U.S. Patent No. 5,710,079). Claim 42 is canceled without prejudice making the rejection of such claim moot, hence Applicant traverses the rejection of Claims 39-40, 44, 47 and 49.

Of Claims 39-40, 44, 47 and 49, Claims 39 and 47 are independent claims, from which Claims 40, 44, and 49 depend, respectively. Such independent claims recite, in pertinent part, "39. A semiconductor processing method of depositing SiO_2 on a substrate within a **low pressure chemical vapor deposition reactor,**" and "47. A semiconductor processing method of chemical vapor depositing SiO_2 on a

substrate comprising: placing a substrate within a **low pressure chemical vapor deposition reactor**" (emphasis added).

In contrast, Sukharev describes at column 1, lines 36-51, that at least three TEOS-based chemical vapor depositions (CVD) processes are commonly used, and that these processes include a plasma enhanced process (PECVD), a low pressure process (LPCVD) and an atmospheric process (APCVD). Sukharev further describes, column 1, line 66 – column 2, line 18, that such known processes have associated problems for which a solution would be desirable. Specifically Sukharev mentions the formation of voids 108, referring to Fig. 1, a slow TEOS decomposition rate and incomplete removal of carbon containing moieties from the deposited films.

Sukharev asserts that the solution to these problems, as well as a more efficient use of the TEOS, is the combination of directing ultraviolet radiation into the process chamber with a source of ozone (col. 2, lines 25-28, and ibid, lines 46-52). As illustrated in Fig. 3, and accompanying text at column 3, lines 44-47, the process chamber employed by Sukharev is an APCVD chamber. Applicant respectfully asserts that since Sukharev is silent as to whether an LPCVD reactor, such as recited in Applicant's Claims 39 and 47, can be employed with the method of the patent, this aspect of such claims is not taught or even suggested by Sukharev. Since to sustain a rejection under §102 each aspect of the claimed invention must be anticipated by the cited art, for at least this one omission, Sukharev CANNOT anticipate Claims 39 and 47.

Claims 39 and 47 also recite, among other things, that the quantity of "H_2O and H_2O_2" (Claim 39) or "oxide of hydrogen" (Claim 47) employed comprises at least about 5% by volume of the material fed into the reactor.

The Examiner alleges that the concentration ranges taught by Sukharev overlap that which is recited in Applicant's claims. Respectfully, Applicant asserts that such an allegation is incorrect. Rather, Sukharev, employs very different quantities of such materials. For example, at column 7, lines 51-65, Sukharev provides concentration ranges for each of the moieties that are provided within the reaction mixture provided to his APCVD reactor. Such listing provides that water can be between 0.5% and 3% with 1.5% being preferred and that the hydrogen peroxide can be between 0 and 3% with 0.5% being preferred. Thus Sukharev does not teach or even suggest the at least about 5% by volume of the material fed into the reactor for the H_2O and H_2O_2, or oxides of hydrogen, as recited by Applicant in Claims 39 and 47, yet alone the as much as 50% recited in Claim 40. Hence for this additional reason, Sukharev CANNOT anticipate such claims.

Applicant has shown above that two aspects of Claims 39 and 47 are not taught or even suggested by the cited art, Sukharev. Applicant respectfully asserts, that for at least these reasons, the instant rejection of such claims is incorrect and should be withdrawn. Since Claims 40, 44 and 49 depend from Claims 39 and 47, respectively, it follows that the

instant rejection of such dependent claims is also incorrect and should be withdrawn. Action to this effect is requested.

Rejection Under 35 U.S.C. §103(a)

Sukharev

Claims 39-42, 44, 47 and 49 are rejected under 35 U.S.C. §103(a) as being unpatentable over Sukharev. Claim 42 is canceled without prejudice making the rejection of such claim moot, hence Applicant traverses the rejection of Claims 39-41, 44, 47 and 49.

As shown above with respect to the rejection under §102, Sukharev does not teach or even suggest the LPCVD reactor or the concentrations of H_2O and H_2O_2, or oxides of hydrogen, recited in Applicant's Claims 39 and 47. Such showing is reasserted in Applicant's response to the instant rejection. Applicant further notes that Claim 41 recites, in pertinent part, that at least one of the H_2O and H_2O_2 comprises 5% to 15% of the material fed into the reaction chamber and that Sukharev does not teach or suggest this additional concentration range.

It is noted that the Examiner states that the concentration ranges recited by Sukharev are close to Applicant's 5%-15% range, Applicant respectfully disagrees. First, Sukharev's highest value is only about half of what Applicant establishes as the minimum concentration claimed, and where preferred values are considered, the difference grows dramatically. Thus for water the difference is extended to more than a factor of 3 (1.5% versus 5%) and for hydrogen peroxide the difference is a factor of ten

(0.5% versus 5%). Second, Applicant asserts that *In re Huang*, rather than supporting the Examiner's position, is dispositive that the ranges recited in Sukharev DO NOT suggest the ranges claimed by Applicant. Specifically, and as stated by the Examiner on page 6 of the instant Office Action, *In re Huang* states that non-overlapping ranges from a cited reference are only suggestive of a claimed range where is NO "**new and unexpected result which is different in kind and not merely in degree from the prior art**" (emphasis added). Since such a new and unexpected result is precisely what Applicant is claiming, the ranges recited by Sukharev CANNOT suggest those recited by Applicant. Applicant respectfully asserts that the Examiner's rejection under §112, above, as well as the statements regarding inherency of Sukharev's teachings in view of Applicant's specification and claims are an admission that Applicant has obtained a new and unexpected result.

It is well established that under §103, the cited art must teach or suggest all the limitations recited in the rejected claims to sustain the rejection of such claims. In the instant rejection, the reassertion of the remarks from the rejection under §102, as well as the remarks directed to *In re Huang,* show that Sukharev does not meet this standard. Thus for at least these reasons, Sukharev CANNOT make Claims 39-41, 44, 47 and 49 unpatentable and the rejection under §103 should be withdrawn. Applicant respectfully requests such action.

Sukharev in view of Wolf

Claims 45-46, 48, 50-51 and 52 are rejected under 35 U.S.C. §103(a) as being unpatentable over Sukharev in view of Wolf (Silicon Processing for the VLSI Era, Vol. 1).

Claims 45 and 46 depend from Claim 39. Claims 50 and 51 depend from Claim 47. As asserted above, each of Claims 39 and 47 recite that an LPCVD reactor is employed and that the quantity of "H_2O and H_2O_2" (Claim 39) or "oxide of hydrogen" (Claim 47) employed comprises at least about 5% by volume of the material fed into the reactor. With regard to this aspect of concentration, Applicant has shown above that to be in accordance with the holding of *In re Huang,* one must consider Applicant's concentration ranges patentably distinct from those of Sukharev. Thus Applicant asserts that since Sukharev has been shown NOT to teach or even suggest at least these two aspects of Claims 39 and 47, Sukharev CANNOT teach or suggest such aspects of Claims 45, 46, 50 and 51. In addition, since Claim 48, from which Claim 52 depends, also recites, among other things, the LPCVD and concentration aspects recited in Claims 39 and 47, Sukharev CANNOT teach or suggest such aspects of such claims.

With regard to Sukharev's omission of even a suggestion that an LPCVD reactor can be employed with his method, the Examiner suggests that *Wolf* teaches that hot-wall, low-pressure CVD reactors are the most widely used reactors and that *Wolf* also teaches the benefits of using cold wall reactors. Without admission as to *Wolf's* statistics, but taking such a

teaching as true, arguendo, the Examiner's alleged combination of *Wolf* with Sukharev fails for lack of a motivation to make the combination suggested. Thus where the Examiner alleges that "it would have been obvious to one of ordinary skill in the art at the time of the invention to apply the teachings of **Wolf** to the **Sukharev** reference" it is well established such a combination is NOT obvious unless there is some motivation or suggestion for the combination to be made (MPEP §2143.01). Here, Applicant asserts that there is NO SUCH MOTIVATION.

Referring to Sukharev, and as remarked in the response to the rejection under §102, Sukharev states that an LPCVD process is known (col. 1, lines 39-40). Applicant asserts, therefore, that Sukharev's silence as to the applicability of LPCVD, or even PECVD, to his method would lead the artisan of ordinary skill to **conclude** that such processes would NOT work with LPCVD or PECVD reactors as the use of each would reduce the amount of reactants present in the reaction chamber to levels unacceptable for the Sukharev process. However even if the Examiner disagrees that there is no motivation to combine *Wolf* with Sukharev, such combination is not represented by the Examiner as teaching or even suggesting Applicant's concentrations, as discussed above. It thus follows that the instant rejection is INCORRECT and should be withdraw, Action to this effect is earnestly sought.

Related, not relied upon art, Homma and Kubo et al.

The Examiner alleges that both Homma and Kubo anticipate at least Applicant's independent claims. Applicant disagrees.

Specifically, Kubo et al., like Sukharev, teaches only an APCVD reactor (col. 5, line 18). With regard to Homma, such appears to be silent as to the type of CVD reactor employed or the concentration of the various gases employed. Thus Homma does not seem to suggest any specific amount of "steam" employed and seems to limit the temperature of the substrate to a maximum of 200 degrees Celsius (see, Claim 2).

In summary, Applicant having responded to each of the rejections and objections, respectfully asserts that Claims 39-41 and 44-52 are in condition for allowance. Action to that effect is earnestly sought. If, however the Examiner's next action is anything other than a Notice of Allowance, the Examiner is requested to call the undersigned to schedule a telephonic interview. The undersigned is available during normal business hours, Pacific Coast Time.

Respectfully submitted,

Dated: Aug 27, 2001

By: Bernard Berman
Bernard Berman
Reg. No. 37,279

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application Serial No. 09/212,726
Filing Date ..... December 15, 1998
Inventor ..... Klaus Florian Schuegraf
Assignee ..... Micron Technology, Inc.
Group Art Unit 2813
Examiner ..... E. Kielin
Attorney's Docket No. MI22-1098
Title: Semiconductor Processing Methods of Chemical Vapor Depositing SiO_2 on a Substrate

VERSION WITH MARKINGS TO SHOW CHANGES MADE ACCOMPANYING RESPONSE TO FEBRUARY 28, 2001 OFFICE ACTION

The claims have been amended as follows. Underlines indicate insertions and ~~strikeouts~~ indicate deletions.

39. A semiconductor processing method of depositing SiO_2 on a substrate within a low pressure chemical vapor deposition reactor comprising feeding at least one of H_2O and H_2O_2 into the low pressure chemical vapor deposition reactor while feeding an organic silicon precursor, wherein the at least one of H_2O and H_2O_2 is fed into the reactor separately from the organic silicon precursor, comprises at least about 5% by volume of the material fed into the reactor, and under conditions which are effective to reduce formation of undesired reaction intermediates of the organic silicon precursor which form at higher topographical elevations on the substrate than would otherwise occur without the feeding of the at least one of H_2O and H_2O_2 into the reactor under otherwise identical depositing conditions.

new matter

Cancel Claim 42.

46. The semiconductor processing method of Claim ~~38~~ 39, wherein the chemical vapor deposition reactor is a cold wall reactor.

47. A semiconductor processing method of chemical vapor depositing SiO_2 on a substrate comprising:

placing a substrate within a low pressure chemical vapor deposition reactor;

feeding an organic silicon precursor into the low pressure chemical vapor deposition reactor having the substrate positioned therein under conditions effective to decompose the precursor into SiO_2 which deposits on the substrate and into a gaseous oxide of hydrogen; and

feeding an additional quantity of the gaseous oxide of hydrogen into the low pressure chemical vapor deposition reactor while feeding the organic silicon precursor into the reactor, the additional quantity comprising at least about 5% by volume of the material fed into the reactor, wherein the organic silicon precursor and the additional quantity of the gaseous oxide of hydrogen are fed into the reactor from separate feed streams and under conditions which are effective to reduce formation of undesired reaction intermediates of the organic silicon precursor which form at higher topographical elevations on the substrate than would otherwise occur without the feeding of the at least one of H_2O and H_2O_2 into the reactor under otherwise identical depositing conditions.

new matter

48. A semiconductor processing method of chemical vapor depositing SiO_2 on a substrate comprising:

placing a substrate within a hot-wall, low-pressure chemical vapor deposition reactor;

feeding an organic silicon precursor into the hot wall, low-pressure chemical vapor deposition reactor having the substrate positioned therein;

feeding an additional quantity of the gaseous oxide of hydrogen into the hot wall, low pressure chemical vapor deposition reactor while feeding the organic silicon precursor into the reactor, wherein the organic silicon precursor and the additional quantity of the gaseous oxide of hydrogen are fed into the reactor from separate feed streams, the additional quantity comprising at least about 5% by volume of the material fed into the reactor; and

providing conditions effective to decompose the precursor into SiO_2 at a theoretical decomposition rate and effective to cause the additional quantity of gaseous oxide of hydrogen to reduce the theoretical decomposition rate to a lower actual decomposition rate, the reducing a function of at least some of the additional quantity of gaseous oxide of hydrogen reducing formation of undesired reaction intermediates of the organic silicon precursor which form at higher topographical elevations on the substrate than would otherwise occur without the feeding of the at least one of H_2O and H_2O_2 into the hot-wall, low-pressure chemical vapor deposition reactor under otherwise identical depositing conditions.

Inventor: Klaus F. Schuegraf

Title: Semiconductor Processing Methods of Chemical Vapor Depositing SiO_2 on a Substrate

Assignee: Micron Technology, Inc.

INFORMATION DISCLOSURE STATEMENT

References -- See Attached Form PTO-1449

The attached form PTO-1449 is submitted in compliance with 37 CFR §1.56. No admission is made regarding whether all the submitted references are prior art.

Respectfully submitted,

Dated: 12/15/98 Attorney: _____

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Form PTO-1449

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

LIST OF ART CITED BY APPLICANT

(Use several sheets if necessary)

ATTY. DOCKET NO.	PRIORITY SERIAL NO.
MI22-1098	08/696,243
APPLICANT: Klaus F. Schuegraf	
PRIORITY FILING DATE: 08/13/96	PRIORITY GROUP: 2813

jc549 U.S. PTO 08/696243 08/13/96

EL465229828

U.S. PATENT DOCUMENTS

*Examiner Initial		Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
EK	AA	5,763,018	6/1998	Sato	438	790	
EK	AB	5,710,079	1/1998	Sukharev	438	778	
	AC	5,238,671	8/1993	Matson et al.	423	397	
	AD	5,610,105	3/1997	Vines et al.	437	238	
	AE	5,472,913	12/1995	Havemann et al.	437	238	
	AF	5,470,800	11/1995	Muroyama	437	238	
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	AH	5,580,822	12/1992	Hayakawa et al.	437	187	
	AI	5,420,075	5/1995	Homma et al.	437	195	
EK	AJ	5,360,646	11/1994	Morita	427	574	

FOREIGN PATENT DOCUMENTS

		Document Number	Date	Country	Class	Subclass	Translation Yes	Translation No
	AL	6349747	~~12/1994~~	~~Japan~~				
	AM							
	AN							
	AO							
	AP							

OTHER REFERENCES (including Author, Title, Date, Pertinent Pages, Etc.)

EK	AR		IslamRaja, et al., "Two Precursor Model For Low-Pressure Chemical Vapor Deposition Of Silicon Dioxide From Tetrethylorthosilicate", J. Vac. Sci. Technol. B, Vol. 11, No. 3, May/Jun 1993, pp. 720-726.
EK	AS		Crowell, John E. et al., "The Chemical Vapor Deposition Of SiO_2 From TEOS", Journal of Electron Spectroscopy And Related Phenomena, 54/55 (1990) pp. 1097-1104.
EK	AT		Haupfear, E.A. et al., "Kinetics of SiO_2 Deposition From Tetraethylorthosilicate", Electrochem. Soc. Vol. 141, No. 7, July 1994, pp. 1943-1950.

EXAMINER: Eric Kielin

DATE CONSIDERED: 6/14/00

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

EL169836625

Form PTO-1449

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

ATTY. DOCKET NO.	PRIORITY SERIAL NO.
M122-1098	08/696,243
APPLICANT: Klaus F. Schuegraf	
PRIORITY FILING DATE: 08/13/96	PRIORITY GROUP: 2813

LIST OF ART CITED BY APPLICANT

(Use several sheets if necessary)

U.S. PATENT DOCUMENTS

*Examiner Initial		Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
CK	AA	5,182,221	1/1993	Sato	437	67	
	AB						
	AC						
	AD						
	AE						
	AF						
	AG						
	AH						
	AI						
	AJ						

FOREIGN PATENT DOCUMENTS

		Document Number	Date	Country	Class	Subclass	Translation Yes	Translation No
	AL							
	AM							
	AN							
	AO							
	AP							

OTHER REFERENCES (including Author, Title, Date, Pertinent Pages, Etc.)

CK	AR		Wolf, Stanley, "Silicon Processing for the VLSI Era", Vol. 1, pp. 166-171
CK	AS		"Hawley's Condensed Chemical Dictionary", 12th Ed., 1993, pg. 500
	AT		

EXAMINER: Eric Kielin

DATE CONSIDERED: 6/14/00

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.